### **AMENDMENT TO THE DRAWINGS**

The attached sheet(s) of drawings includes changes to Figs. 3, 16, 17, 42, 43, 62, 75, and 79. Also attached are annotated sheets showing the changes made to Figs. 3, 16, 17, 42, 43, 62, 75, and 79.

Attachment: Replacement Sheet(s), eight pages
Annotated Sheet(s) Showing Changes, eight pages

Application No.: PCT/JP2004/009472
 Amendment Dated: December 23, 2005

#### **REMARKS**

If clarification of the amendment or application is desired, or if issues are present which the Examiner believes may be quickly resolved, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present application.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 18-0160, our Order No. SAT-16280.

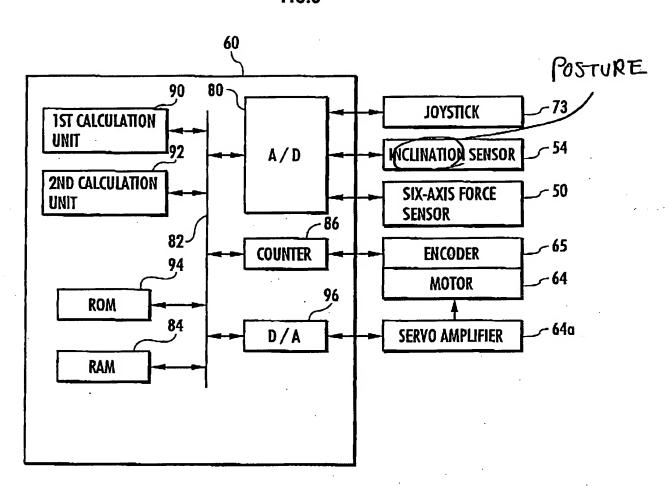
Respectfully submitted,

RANKIN, HILL, PORTER & CLARK LLP

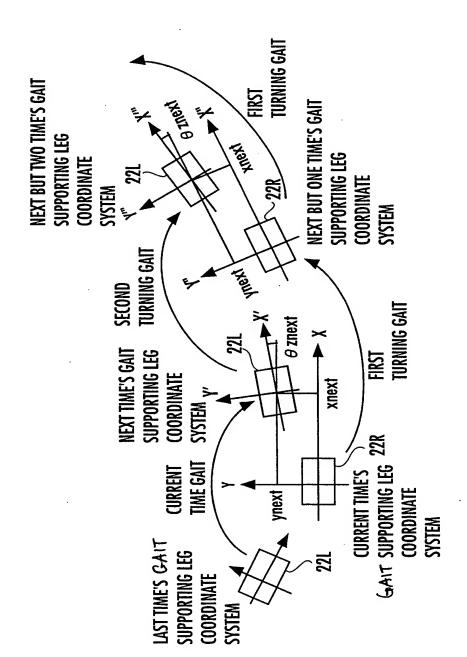
David E. Seaw. Reg. No. 34732

4080 Erie Street Willoughby, Ohio 44094-7836 (216) 566-9700 Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT"
First Named Inventor: Toru Takenaka
National Stage of PCT/JP2004/009472
Customer No. 40854; Docket No. SAT-16280
Page 1 of 8
Annotated Sheet Showing Changes

FIG.3

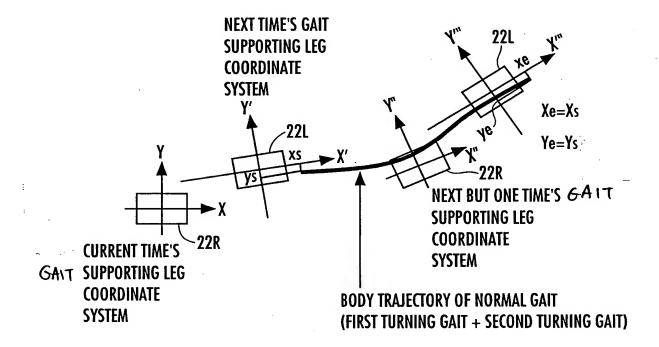






Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT"
First Named Inventor: Toru Takenaka
National Stage of PCT/JP2004/009472
Customer No. 40854; Docket No. SAT-16280
Page 3 of 8
Annotated Sheet Showing Changes

### **FIG.17**



## Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT"

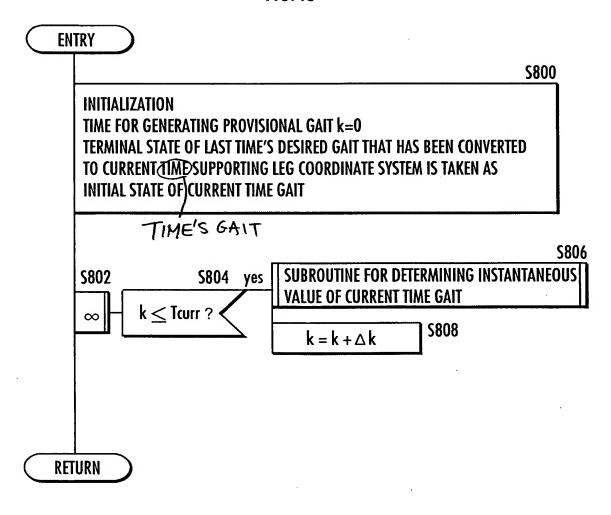
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National Stage of PCT/JP2004/009472
Customer No. 40854; Docket No. SAT-16280
Page 4 of 8
Annotated Sheet Showing Changes

ENTRY	FIG.42
\$700 ∞	CALCULATE PROVISIONAL CURRENT TIME GAIT UNTIL END TIME ON THE BASIS OF PROVISIONAL DESIRED ZMP AND OTHER CURRENT TIME GAIT PARAMETERS.
	DETERMINE TERMINAL DIVERGENT COMPONENT q0[k] ACCORDING TO THE FOLLOWING EQUATION FROM BODY POSITION/VELOCITY (XeVe) AT END OF CURRENT TIME GAIT. $q0[k] = Xe + Vxe / \omega 0$
	DETERMINE TERMINAL DIVERGENT COMPONENT ERROR errq ACCORDING TO THE FOLLOWING EQUATION: $errq = q0[k] - q$ "
	O S708 yes LEAVE REPETITION LOOP S710
	CALCULATE PROVISIONAL CURRENT TIME GAIT UNTIL END TIME ON THE BASIS OF DESIRED ZMP OBTAINED BY ADDING CORRECTION TO PROVISIONAL DESIRED ZMP ACCORDING TO RELATIONSHIP OF FIG. 44, ASSUMING THAT $\alpha = \Delta$ $\alpha$ .
	DETERMINE TERMINAL DIVERGENT COMPONENT q1[k] ACCORDING TO THE FOLLOWING EQUATION ON THE BASIS OF BODY POSITION/VELOCITY (Xe1,Vxe1) AT END OF CURRENT TIME GAIT RECALCULATED ON THE BASIS OF DESIRED ZMP TO WHICH CORRECTION HAS BEEN ADDED: $q1[k] = Xe1 + Vxe1 / \omega0$
	DETERMINE PARAMETER SENSITIVITY $r$ ACCORDING TO THE FOLLOWING EQUATION: S714 $r = (q1[k] - q0[k])/\Delta \alpha$
	ADD CORRECTION AMOUNT BASED ON a=-errq/r TO PROVISIONAL S716 DESIRED ZMP TO PROVIDE UPDATED PROVISIONAL DESIRED ZMP.  \$718
DETERMINE BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE PATTERN ON THE BASIS OF DIFFERENCE BETWEEN TERMINAL BODY POSTURE ANGLE OF PROVISIONAL CURRENT TIME GAIT AND INITIAL BODY POSTURE ANGLE OF NORMAL GAIT AND DIFFERENCE BETWEEN TERMINAL BODY POSTURE ANGULAR VELOCITY OF PROVISIONAL CURRENT TIME GAIT AND INITIAL BODY POSTURE ANGULAR VELOCITY OF NORMAL GAIT.	
DETER RESTO	MINE, AS DESIRED ZMP PATTERN, THE PATTERN OBTAINED BY ADDING BODY INCLINATION RING MOMENT ZMP-CONVERTED VALUE PATTERN TO PROVISIONAL DESIRED ZMP PATTERN.  \$720
OF DIE GAIT A ANTIP	MINE ANTIPHASE ARM SWING RESTORING ANGULAR ACCELERATION PATTERN ON THE BASIS FERENCE BETWEEN TERMINAL ANTIPHASE ARM SWING ANGLE OF PROVISIONAL CURRENT TIME AND INITIAL ANTIPHASE ARM SWING ANGLE OF NORMAL GAIT AND DIFFERENCE BETWEEN TERMINAL HASE ARM SWING ANGULAR VELOCITY OF PROVISIONAL CURRENT TIME GAIT AND INITIAL HASE ARM SWING ANGULAR VELOCITY OF NORMAL GAIT

**RETURN** 

Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT"
First Named Inventor: Toru Takenaka
National Stage of PCT/JP2004/009472
Customer No. 40854; Docket No. SAT-16280
Page 5 of 8
Annotated Sheet Showing Changes

**FIG.43** 



# Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT" First Named Inventor: Toru Takenaka National Stage of PCT/JP2004/009472 Customer No. 40854; Docket No. SAT-16280 Page 6 of 8

Annotated Sheet Showing Changes

### **FIG.62**

### **ENTRY**

DETERMINE DIFFERENCE IN HORIZONTAL BODY POSITION BETWEEN MODELS, WHICH IS THE DIFFERENCE BETWEEN HORIZONTAL BODY POSITION OF CORRECTED GAIT AND HORIZONTAL BODY POSITION OF ORIGINAL GAIT.

**S2200** 

DETERMINE DIFFERENCE IN BODY POSTURE INCLINATION ANGLE BETWEEN MODELS, WHICH IS THE DIFFERENCE BETWEEN BODY POSTURE INCLINATION ANGLE OF CORRECTED GAIT AND BODY POSTURE INCLINATION ANGLE OF ORIGINAL GAIT.

**S2202** 

DETERMINE DIFFERENCE IN ANTIPHASE ARM SWING ANGLE BETWEEN MODELS, WHICH IS THE DIFFERENCE BETWEEN ANTIPHASE ARM SWING ANGLE OF CORRECTED GAIT AND ANTIPHASE ARM SWING ANGLE OF ORIGINAL GAIT.

**S2204** 

DETERMINE REQUIRED VALUE OF MODEL HORIZONTAL BODY POSITION STABILIZATION FLOOR REACTION FORCE MOMENT NECESSARY TO CONVERGE DIFFERENCE TO ZERO ON THE BASIS OF DIFFERENCE IN HORIZONTAL BODY POSITION BETWEEN MODELS.

**S2206** 

DETERMINE REQUIRED VALUE OF MODEL BODY POSTURE INCLINATION ANGLE STABILIZATION FLOOR REACTION FORCE MOMENT NECESSARY TO CONVERGE DIFFERENCE TO ZERO ON THE BASIS OF DIFFERENCE IN BODY POSTURE INCLINATION ANGLE BETWEEN MODELS.

**S2208** 

DETERMINE REQUIRED VALUE OF MODEL ANTIPHASE ARM SWING ANGLE STABILIZATION FLOOR REACTION FORCE MOMENT NECESSARY TO CONVERGE DIFFERENCE TO ZERO ON THE BASIS OF DIFFERENCE IN ANTIPHASE ARM SWING ANGLE BETWEEN MODELS.

S2210

**S2212** 

DETERMINE MODEL HORIZONTAL BODY POSITION STABILIZATION MOMENT, MODEL BODY POSTURE ANGLE STABILIZATION MOMENT, MODEL ANTIPHASE ARM SWING ANGLE STABILIZATION MOMENT, HORIZONTAL BODY ACCELERATION, BODY POSTURE ANGULAR VELOCITY, AND ANTIPHASE ARM SWING ANGULAR ACCELERATION SUCH THAT THEY SATISFY RESTORING CONDITIONS.

MODEL MANIPULATION FLOOR REACTION FORCE MOMENT HORIZONTAL COMPONENT

S2214

- = MODEL HORIZONTAL BODY POSITION STABILIZATION MOMENT
- + MODEL BODY POSTURE ANGLE STABILIZATION MOMENT

DESIRED FLOOR REACTION FORCE MOMENT HORIZONTAL COMPONENT FOR COMPLIANCE CONTROL

- = COMPENSATING TOTAL FLOOR REACTION FORCE MOMENT HORIZONTAL COMPONENT Mdmdxy
- + MODEL MANIPULATION FLOOR REACTION FORCE MOMENT HORIZONTAL COMPONENT

**S2216** 

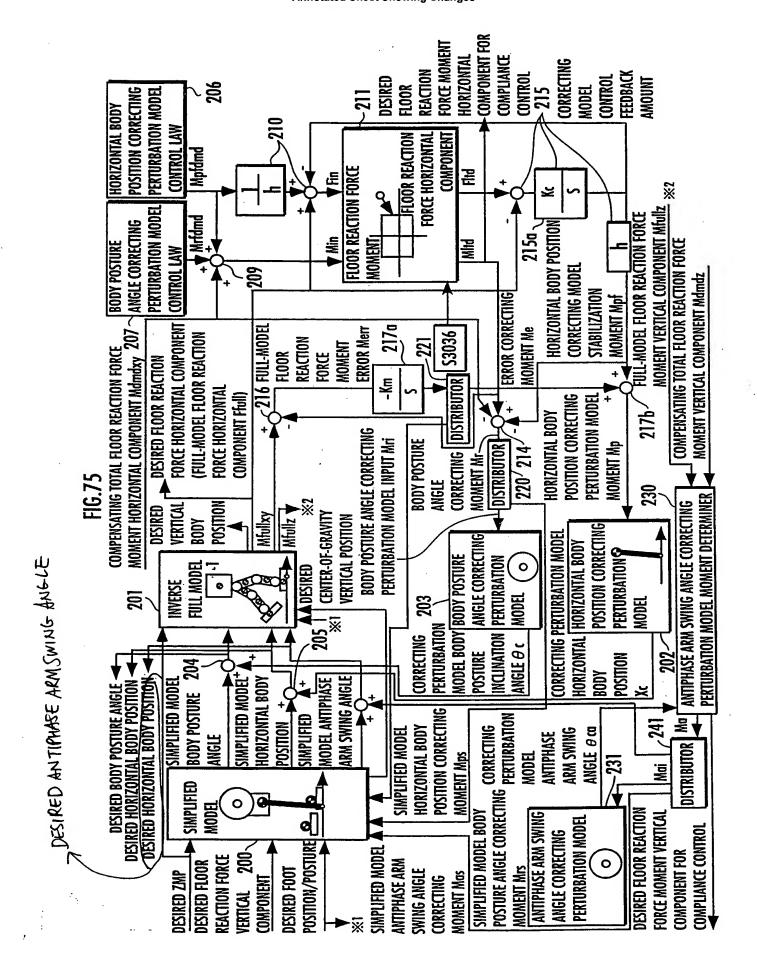
DESIRED FLOOR REACTION FORCE MOMENT VERTICAL COMPONENT FOR COMPLIANCE CONTROL

- = COMPENSATING TOTAL FLOOR REACTION FORCE MOMENT HORIZONTAL COMPONENT Mdmdz
- + FLOOR REACTION FORCE MOMENT VERTICAL COMPONENT/BALANCING WITH CORRECTED GAIT

S2218

RETURN

VERTICAL



Title: "CONTROL DEVICE FOR LEGGED MOBILE ROBOT"
First Named Inventor: Toru Takenaka
National Stage of PCT/JP2004/009472
Customer No. 40854; Docket No. SAT-16280
Page 8 of 8
Annotated Sheet Showing Changes

### **FIG.79**

